# EF Scale stakeholders history and future directions

James LaDue  EF Scale town-hall forum,

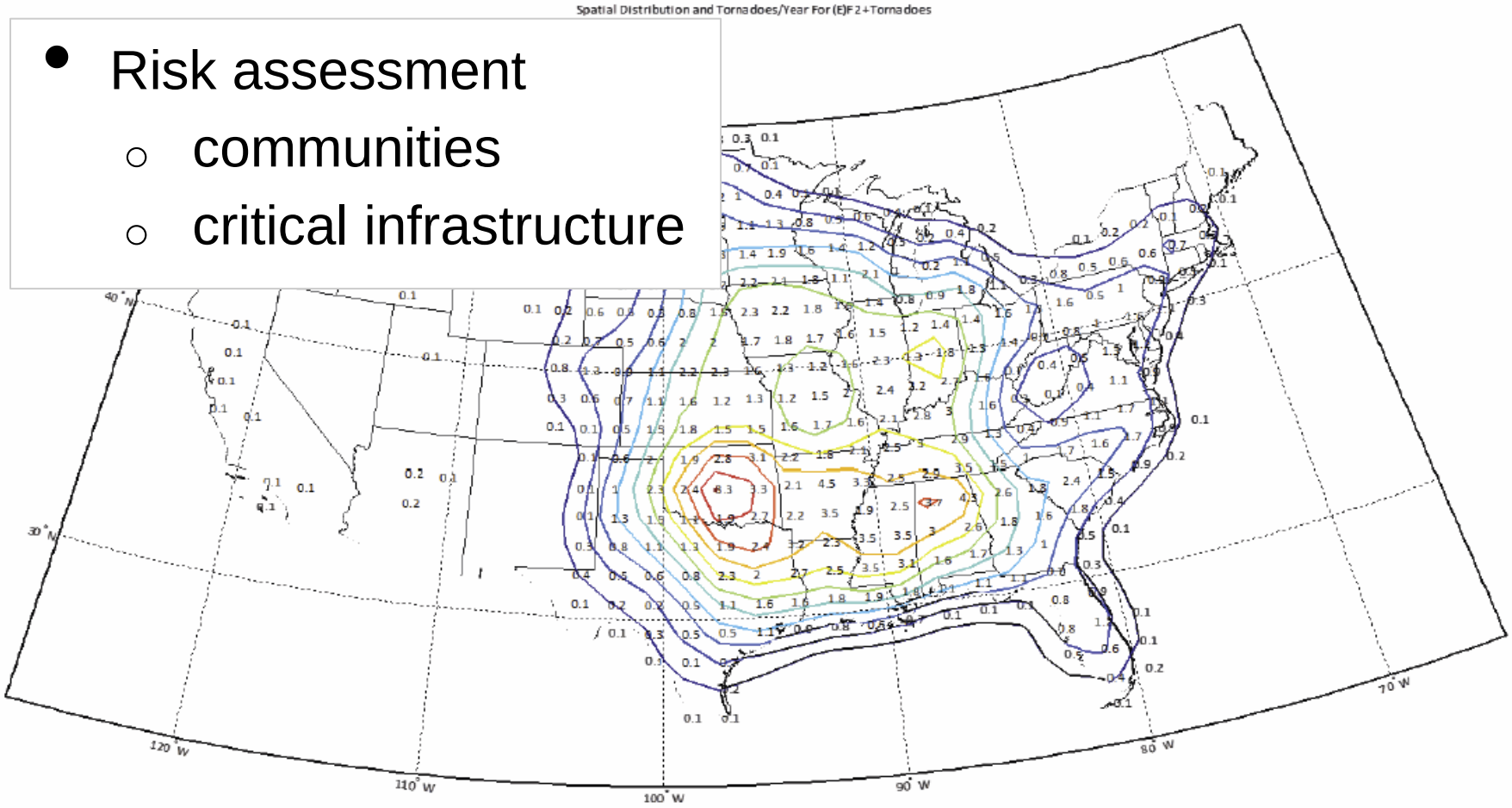
03 Feb 2014
Atlanta, GA

# outline

- The need for scales for tornadoes
- history of EF scale development
- EF scale application and initial assessment
- EF scale stakeholders group - who are the users
  - Stakeholders represented
- Desires for changes in the EF scale
  - publications include (NWS service assessments, FEMA 2011, NIST 2013, BAMS 2012)
- New techniques rapidly developed
- Constraints and policies

# The need for tornado intensity estimation

- Risk assessment
  - communities
  - critical infrastructure

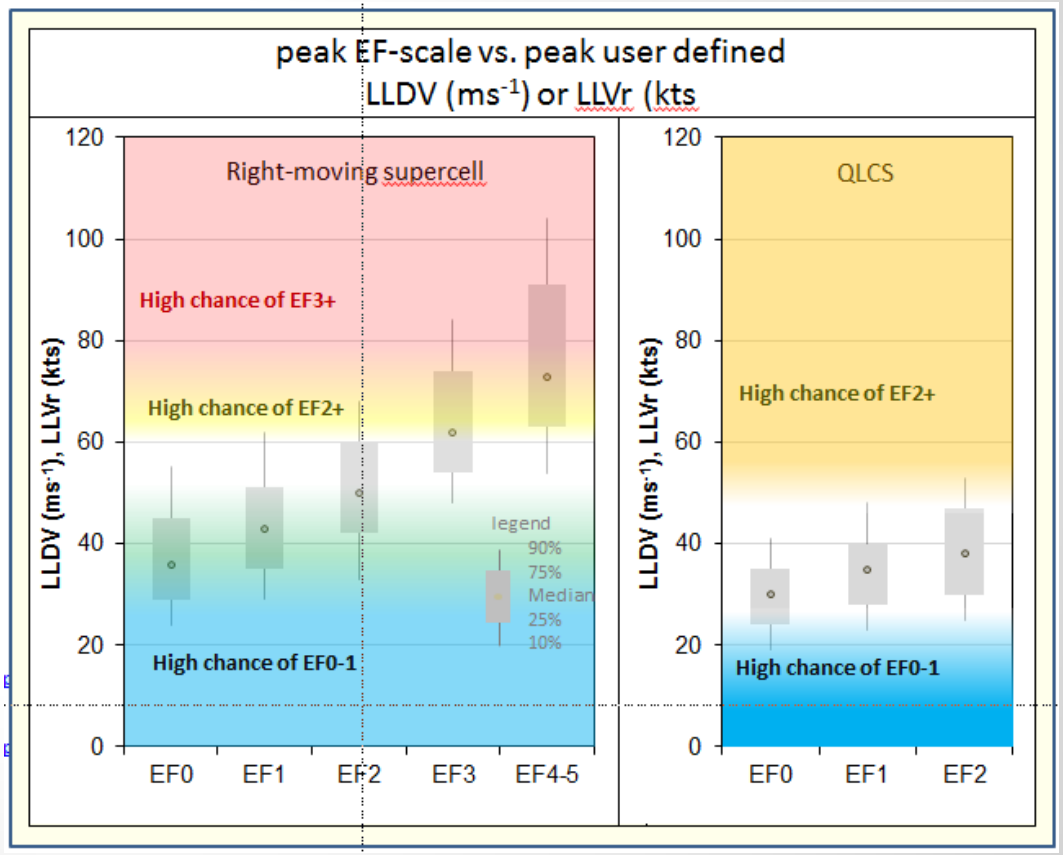



Data Source: NOAA. Analysis by NIST.

**Figure 2– 33. Probability density of EF–2 or greater tornadoes from 1980 through 2011 with EF–2 or stronger tornadoes per year values shown at each grid point.**

# The need for tornado intensity estimation

Improved forecasts and warnings

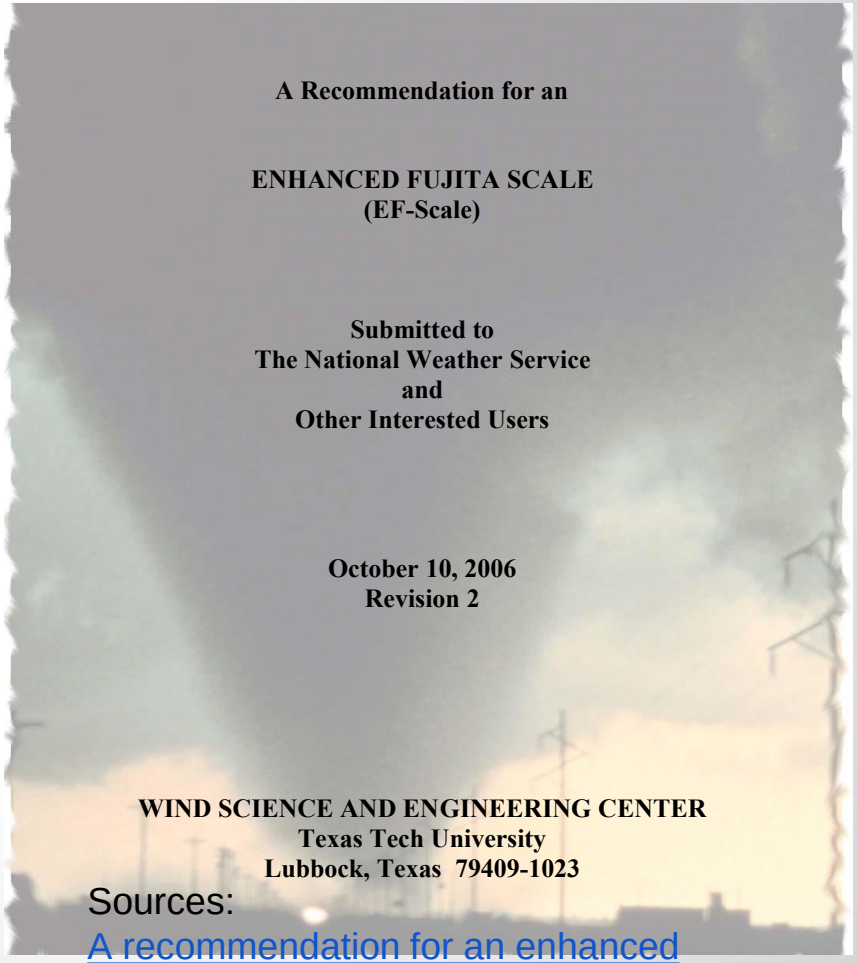



Adapted from Smith et al. (2013)

# EF-scale implemented in 2007

Purpose:

- A six-level numerical, damage-based classification of estimated wind speeds
- 28 damage indicators (DIs)
- Multiple degrees of damage (DOD)for each DI




Sources:
A recommendation for an enhanced Fujita scale
AMS glossary,

# EF Scale applied to notable events

First tornado (EF3): Lady Lakes, FL 2007 Feb 02

First EF4 tornado:  Bluemound, KS 2007 Feb 28

Enterprise, AL EF4:  2007 Mar 01

First EF5 tornado:  Greensburg, KS 2007 May 04

Largest outbreak:  Superoutbreak of 2011 Apr 27

Deadliest tornado:  Joplin 2011 May 22

The controversial El Reno tornado of 2013 May 31

A4:  Enterprise High School, Science Wing

The Historic Tornadoes of April 2011



The EF Scale improved damage surveying in these events.

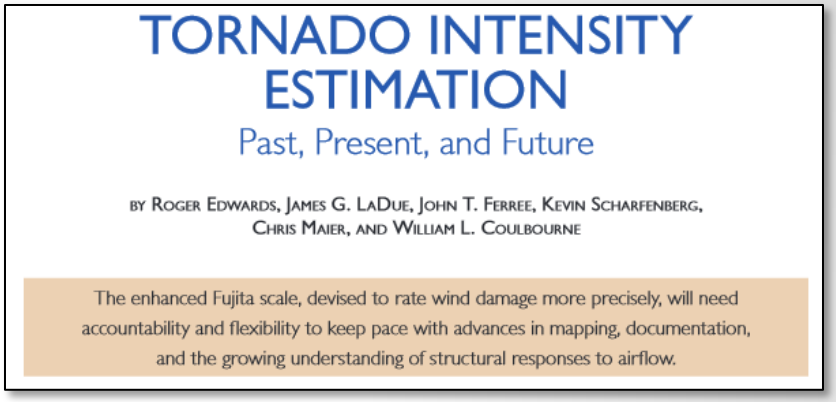
These events also exposed the EF scale to new concerns

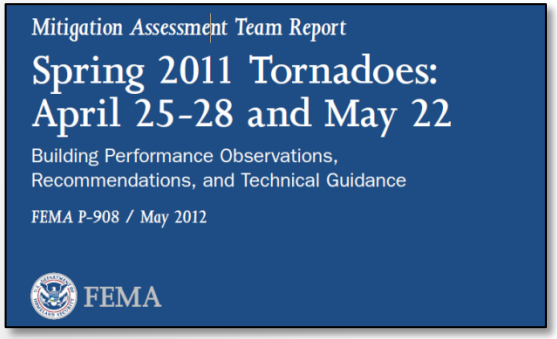
# Concerns with present EF-scale

*2013: Bull. Amer. Meteor. Soc.*, **94**, 641–653.

Incorrect vegetation DIs, need for new DIs

Lack of guidance for current DIs




#40 - DI lists incomplete

#41 – DOD categories inadequate

#42 – gradient of DODs

#43 – Incorrect order of DODs

#44 – lacking photographic DOD guidance

Differences between NWS and FEMA

Finding 7: Lacking adequate DIs and DODs

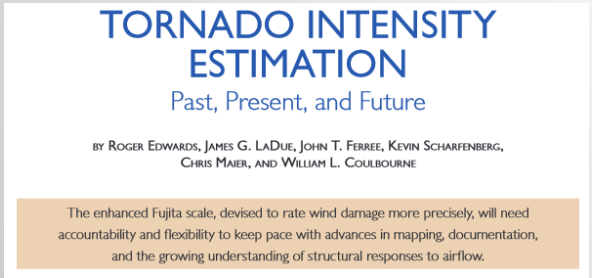
# We need a process to evolve the EF scale


**NIST Recommendation 4**

Develop a committee to propose, accept, implement improvements

# A path to a formal process

Ad-hoc EF scale Stakeholders group


Adopting a standards process

Proposed affiliation

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

Formal EF scale standards committee

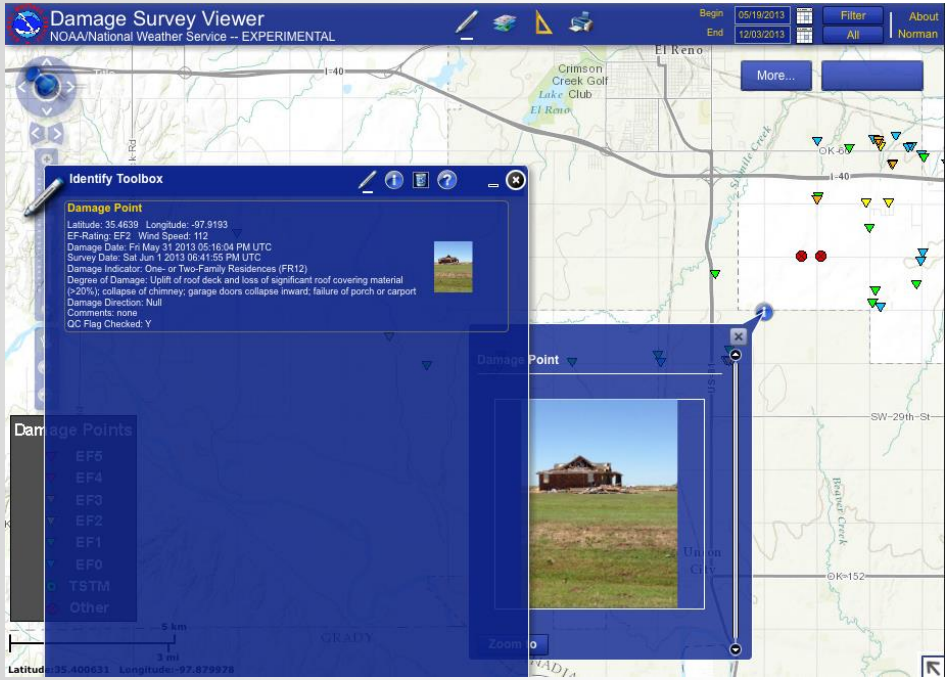
# A path to improving the EF scale

Potential ideas for improvement to

- Current and future DIs
- DODs
- Wind speed thresholds
- Better guidance

What about alternate methods?

# Acknowledging major users' requirements




## NWS needs

### Preserve EF scale method

- Damage-based wind speed estimates
- 'Consistent' application NWS-wide

### Implication:

- EF scale and EF scale method are as one
- New methods external to EF scale

# Alternate methods

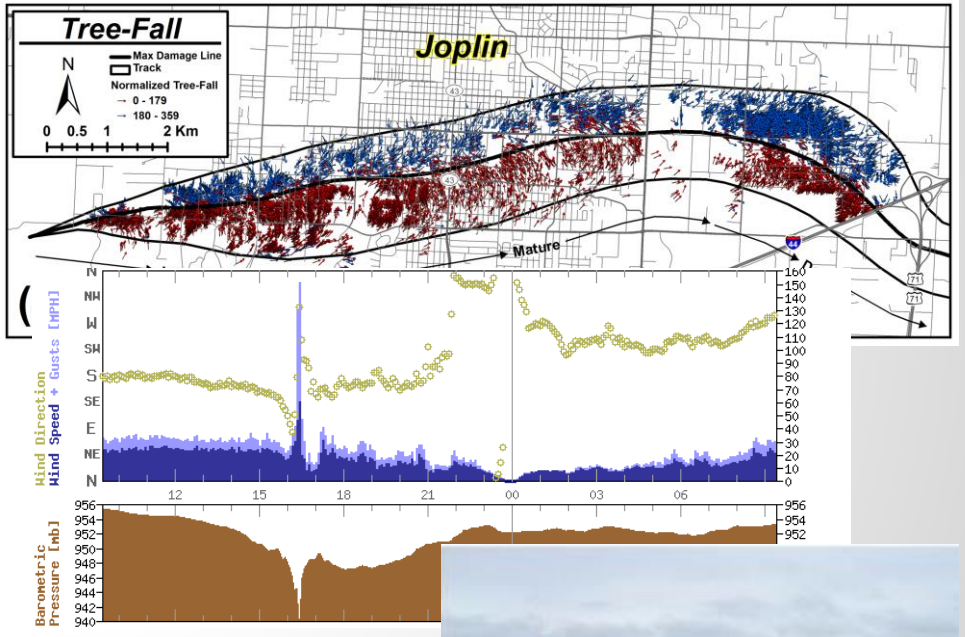
Radar,

Tree-fall patterns,

In-situ anemometry,

Forensic engineering,

and others


# Questions

- How do we incorporate new methods while acknowledging NWS and other agency requirements?

# Panel discussions

1st panel

- Discuss current state and issues of the EF scale

2nd panel

- Discussion on ways to improve the EF scale and new methods